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PHOTOGRAPHS

Photo No 1 Main irrigational canal (Homs-Hama)

Photo No 2 Main irrigational canal (Homs-Hama)
Bridge over the canal near Ayou Village.

Photo No 3 Main irrigational canal (Homs-Hama) Water Distribution Point at Kilometer 60.019 near Besserine Village. At the back of the picture will be seen the aperture for directing leakage water and a number of other outlets leading the water out to other canals.

Photo No 4 The lock, fall and water distribution point near at Km 64 near Maa'rin Village.

Photo No 5 Main irrigational Canal. The canal crossing a valley near Soueida Village.
The length of the supporting walls, is 92 meters.

Photo No 6 Homs-Hama Irrigation Project.
Branch Canal No 9 running parallel to the main road at Ayo Village near Hama and irrigating 1400 hectares (the bed and walls of the canal are being covered with concrete).

MAPS AND DRAWINGS

1. Homs-Hama Irrigation System

2. Cross-Section of Homs Lake Dam

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GENERAL SURVEY OF THE HOMS-HAMA IRRIGATION PROJECT

HYDRAULIC SERVICE FOR THE SOUTHERN REGION

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There is no doubt that for agricultural countries such as Syria, endowed by nature with great beauty and possessing exceptional advantages and which are illustrated by the excellent quality of their soil and the fertility of their vast areas, irrigation projects constitute among others, one of the most important bases of their economic life due to the fact that they open up the way to large revenues and offer to agriculturalists, a happy existence.

That is the reason why the Hydraulic Service in Syria is studying all the possibilities of [illegible] the resources of the "Al Assi" river and the first of these projects is that of the Homs-Hama region.

1. Survey of the "Al-Assi" River and the Homs Lake.

A. The "Al-Assi" River

The River Orontes, as it was called by the Greek and Romans and christened by the Arabs, the "Assi" River in view of the great diversity of its meanderings as compared to other rivers which all run from the north to the south, is one of the biggest rivers in Syria after the Euphrates. It is five hundred and seventy one kilometres long and is of great benefit for the lands bordering it.

The "Assi" rises on Mount Hermel which is formed by a group of hills between the Lebanon and Anti-Lebanon and among the more important sources forming it, should be mentioned the "Al-Zarka", situated at an altitude of 457 metres above sea level and the "Al-Labouat" and "Al Facuar" sources. It follows a course northwards in the plain until it reaches the Homs Lake passing the historical site of "Tal Al Hando" known as the celebrated city of "Kadich".

B. The Lake.

Sloping gently, the river runs towards a lake formed in very ancient times by the building of a dam and into which flowed the waters of the "Assi" together with torrents and a large number of springs including the Al-Tanoum.

It is not known when the dam situated at the north-eastern extremity of the lake, was built. Certain people claim that its constructor was Diocletian, Emperor of Rome, in 290 A.D. but the Arab historian, Abou Al-Fada, attributes its construction to the Seleucides era. It was built for the storage of the waters of the "Assi" in the lake, to be used to a certain extent, for the town of Homs and its gardens.

Before the building of the dam the level of the lake was [illegible] metres above sea level and had an area of 3600 hectares. It is 12 kilometres long with a maximum width of 4 kilometres. Its depth varies from one to four metres. The quantity of water it contains, amounts to 90 million cubic metres of which about 30 million are used for irrigational purposes.

C. Effect of winds on the Lake.

Visitors to the Lake of Homs, have noticed that winds blow there almost continually, generally from the west and sometimes from the south-west and that they frequently develop into a gale as a result of the depression lying between Mt. Kasirie in the Alouite Mountains and Mt. Lebanon, connecting the coast with the interior.

The greatest velocity registered up-to-date in the vicinity of the lake, is 27 metres per second and it can be safely taken that its maximum velocity is about 30 metres per second. According to the meteorological Stations established by the Hydraulic Services, winds blow at a velocity exceeding eight metres per second during two hundred days of the year and that the largest number of gales occur in July and August.

It is to be noted that the majority of the gales, raise the level of the lake. Thus, waves on its right bank, have reached a height 1.20 metres but do not generally speaking, exceed 80 centimetres.

D. Regime of the waters of the Lake.

The first rains falling after the dry season do not perceptibly raise the level of the lake owing to a large quantity infiltrating into the soil but after this absorbtion, the volume of water running into the lake, gradually increases. With the coming of winter, the water level rises rapidly notwithstanding the opening of sluice-gates into the Assi.

The quantity of water which the Assi takes from the dam, cannot exceed forty cubic metres per second, for fear of flooding the neighbouring country-side whereas the quantity of water entering the lake in winter sometimes exceeds one hundred cubic metres per second reaching exceptionally two hundred cubic metres which results in extensive flooding. It has thus become necessary to consider increasing the old dam in height so as to lower the level of the lake and store a greater quantity of water for use during the summer season.

2. Hydraulic Construction in the Homs-Hama region.

The old dam built at the exit from the Homs Lake has been exposed to gradual destruction particularly as it is subjected to attack by the waves and the influence of the gales. Repairs together with the heightening of the lake level in order to benefit by the increase of the capacity of the lake and to use its waters for irrigation.

During the period 1930 - 1933, a vast project for the irrigation of the areas situated between the Lake of Homs and the town of Hama, was drawn up. This project comprised the construction of a new dam together with that for a network of main canals and branch canals for the distribution of water.

A. The new Homs Dam.

This dam has a length of 1120 metres. Its maximum height above the riverbed, is seven metres. The maximum level of the lake reaches 500 metres above sea level. Its capacity is two million cubic metres and the area covered by water, is estimated at six thousand hectares.

The dam consists of a wall of trampled earth resting behind on the ends of the old dam, and having in front, a sheath of metal sheets reinforced with stone piles. The dam itself, is filled with a mass of soil similar to the one described above and which has undergone mechanical compression and covered with pressed stone. It is reinforced with a layer of sand and shingle. The canal is a slanting one of which the top part is five metres and the lower, thirty-five metres long.

B. The Canal System.

The canal system is composed of a main and branch canals.

1. Main Canal.

This canal starts from the dam and runs towards Homs crossing its gardens by means of a syphon 130 metres long and more than 7 metres high. It continues across the plain to the north of Homs surrounding later towards Hama after crossing the Al Assi river by means of a second syphon near "Ar Rastan" of which the length is 2545 metres with a height exceeding 160 metres.

The canal is one a slanting plane with a flow of 6400 litres per second. It measures 2.35 metres of its base and 6.72 metres at its highest point. The incline is of five metres at the base and four at its summit. The volume of water decreases gradually as the canal breaks up into branch canals. It is made entirely in all its parts of ordinary cement of a thickness varying from ten to eighteen centimetres.

2. Branch Canals.

These canals branch off from the main canal, carrying water to the regions to be irrigated.

The flow of water in these various canals is fixed according to the areas to be irrigated, on a basis of 0.20 litre per second per hectare. The length of these canals has been determined in a manner to permit the flow of a surplus of 50% on the quantity needed. The level falls gradually with the branching off of smaller canals.

The length of the branch canals in the Homs region is 58.7 kilometres with 45 kilometres in the Hama area, the better part of which is still under construction.

3. Smaller Canals.

These canals branch off from the branch canals and carry water to the irrigation furrows by means of sluices placed at the beginning of every plot of land to be irrigated.

These canals are made of earth not covered with concrete. Each of them irrigates an average area of 100 hectares. The flow of these smaller canals amounts to 10 litres per second. It can be increased to

40 litres per second, after certain remodellings have been carried out. The water runs away over the soil according to the number of sluices opened.

The construction and consolidation of these smaller canals, are carried out on the responsibility of the owners of the land irrigated but the technical work is carried out by the Administration.

The length of the smaller canals amounts to 260 kilometres of which 200 kilometres have been already built, the balance being under construction.

C. The big "Ar Rastan" Syphon.

The most important construction in the irrigation network in the Homs-Hama region, is the "Ar-Rastan" syphon crossing the "Asi" valley from east to west in order to carry water to the Hama area. This syphon is 2345 metres long and is about 160 metres high. Its flow is 2400 metres per second. This syphon is under construction but a temporary syphon has been constructed to carry drinking water to Hama.

When the irrigation season did not spread over more than seven months of the year, the Administration had to think about using the surplus water arriving at the syphon, for the production of electric power during the interval in irrigation work. It was then possible to utilise a flow of 2400 metres per second at a height of 160 metres between the summit of the Syphon and the bed of the Asi in River. The energy produced was estimated at 4400 kilowatts and facilit ted the introduction of certain seasonal industries, such as the nitrate industry, etc.

D. Area of the irrigated Land.

According to the Homs-Hama Irrigation Project, the irrigated land is estimated at 22000 hectares and is divided up as follows:-

Homs Region: The areas irrigated in this region, are divided up into two categories:

First Category: Areas possessing acquired rights from the old Homs canal, viz:-

Kattineh village	-	45.50	hectares
Tall-al-Chor "	-	33.75	"
Bab Amir "	-	319.50	"
Homs (gardens)	-	905.45	"
	Total	1304.20	hectares

Second Category: Lands to be irrigated according to the new project, with the following areas:

1. Area of lands included in the irrigation network already constructed.

Djeideh Al Atin village	-	156.16	hectares
Bab Amr "	-	300.51	"
Kafar Ala "	-	52.25	"
Dar Al Cabirah "	-	370.48	"
Al Doueir "	-	215.71	"
Deir Baalli "	-	[illegible]	"

Ghanto	Village	-	[illegible]	Hectares
Talbiceh	"	-	3012.21	"
Ar Rastan	"	-	3534.08	"
Omu Charchouk	"	-	646.10	"
Ghajr El Emir		-	361.76	"
Zaafarani		-	222.75	"
	TOTAL		10992.50	hectares

2. Area of lands not yet touched by irrigation network:

Region south of town at Homs	338.80	hectares
Vine-growing region of Talbiceh and its sub divisions	798.65	"
TOTAL	1137.45	"

The total area of irrigable land in the Region of Homs, amounts therefore, to 13434.15 hectares.

Region of Hama.

The branch and smaller canals in the Hama Region are, at present, being built. The area which it is hoped to irrigate with these canals, amount to about 8500 hectares.

Thus, the total area to derive benefit from irrigation measures in the Homs-Hama Region, will be 21934 hectares.

E. Constructional Expenditure.

The constructional work on the dam in the Lake of Homs, the establishing of a network of irrigation canals from the dam to the town of Hama, the construction of the syphon at Homs and the two syphons of "Ar Rastan", (one of them of a provisional and the other, of a permanent nature), all the canals and technical work, will need a sum estimated at eight and half million Syrian Pounds, i.e. about four hundred Syrian Pounds per hectare.

F. Utilisation of the irrigation system to increase the quantity of water used by Hama.

The town of Hama is situated at about 57 kilometres north of the Homs Lake dam. It numbers 75,000 inhabitants. In view of the fact that it has no drinking water and that it has been found impossible to find better sources, it has been decided to make use of the extension of the canal system in the Hama region, to increase the quantity of water coming into that town.

The water level in the main canal when it arrives at the point where the filter beds are situated, five kilometres to the south of the town, is 361 metres above the sea level whereas the highest point in Hama, is only 310 metres above that level, thus rendering the supply of water to the town, quite easy.

It is not concealed that the irrigation canals contain impure water. This has necessitated the taking of measures in order to ensure its filtering and purification. In order to do this, the method of slow purification by means of sand forming deposits and of sterilisation by means

The project was drawn up with the object of allowing the town to benefit by an increase of 6000 cu. metres per day. The water delivery pipe system has been established on that basis. The filter beds, however, can only purify a quantity of two to three thousand cubic metres as it is not considered that the town will consume a greater quantity during the first ten years following the final completion of the project. It must be emphasised, nevertheless, that the adding of further installations for the filtering and purifying of an extra quantity of water, is quite easy and can be rapidly realized should the need of it be felt.

In view of the topographical situation of the town, its internal distribution has been divided into three sections, the first coming direct from the filter reservoir, the second and third from two supplementary distribution reservoirs viz: the Moussaitbeh and Al Moucharfe Reservoirs.

The expenditure incurred in the project based on the taking of the water from the main canal, amounts to two million Syrian Pounds. The major part of the scheme has been completed. There only remains the installing of the mains and delivery pipes. It is hoped to do this in 1943.

3. Regime of Water Distribution in the Homs Hama Region.

The regime adopted for the distribution of irrigation water in the Homs-Hama Region, varies according to the following categories:

First Category: Lands whose first acquired rights. These lands obtain their water through special permits in quantities and during periods corresponding to those allotted to them when they received their water from the old Homs canal in 1931. The special water rationing for this category, varies between 0.60 and 1 litres per second per hectare. The global quantity of water reserved for this category is 1732 litres per second.

Second Category: Lands irrigable by the Homs-Hama irrigation system. The water is distributed to these lands from special mains according to the following basic plans:

A. Rationing of Water.

Water is supplied by the irrigation system according to the area of the holding at the rate of 0.20 litre per second per hectare. On this basis, every hectare receives during the irrigation period from 15th April to 15th October every year:

26 weeks x 7 days x 86400 seconds x 0.20 litres = 3145 cub. metres.

B. Watering Season:

This is divided into two periods:

1. From 15th April to 30th June, for spring growings.

2. From 1st July to 15th October, for summer growings.

C. Watering System.

The water is carried on unharvested lands and fed according to a weekly schedule.

D. Debit of Distribution Canals.

The normal debit for each of the smaller canals has been limited at 40 litres per second on condition that this quantity goes entirely to one plot or a series of plots belonging to one person only.

E. Method of Distribution.

The water is sent into the smaller canals until they are entirely filled. Then, the water is run off through sluices placed at the beginning of every plot starting with the lowest and ending with the highest furrow.

F. Right to use the water of one plot at the expense of motherplot.

The right to use water is an actual right which cannot be transferred from one property to another. But if several properties belong to one and the same owner or if they are similarly rented, this right can be transferred within the limits fixed for the volume of branch and smaller canals.

G. Length of Period of Watering.

This length of period is fixed for each plot according to its area.

Theoretically, this can be calculated in the following manner:

Taking as a unit of time, a second:
The quantity of water reserved for each plot i.e. 0.20 litre x the area of the plot in hectares x days of the week x 86400 seconds.

The debit of the smaller canals is 40 litres per second.

Considering that the loss due to filtration and evaporation in the canal system reaches 15%, the distribution of the water reserved for each hectare, at the rate of 40 litres per second, is

$$\frac{0.85 \times 1 \times 7 \times 86400}{40} = 3477 \text{ seconds or } 57 \text{ minutes.}$$

H. Division of the Watering Regions.

The irrigable areas are divided up in the Nord region into twelve subdivisions. Each of the latter, has a special official called "Inspector for the distribution of water". It is his duty to see that the system of watering is observed and to determine the expenditure.

In no case, this inspector has the right to modify the schedules fixed for the watering system except on written authority from the superintending engineer. He cannot participate in any discussions concerning the distribution of water among the users beyond the sluices. The distribution must be arranged by common agreement.

THIRD CONGRESS OF ENGINEERS

HELD IN DAMASCUS FROM 7TH TO 11TH SEPTEMBER 1947.

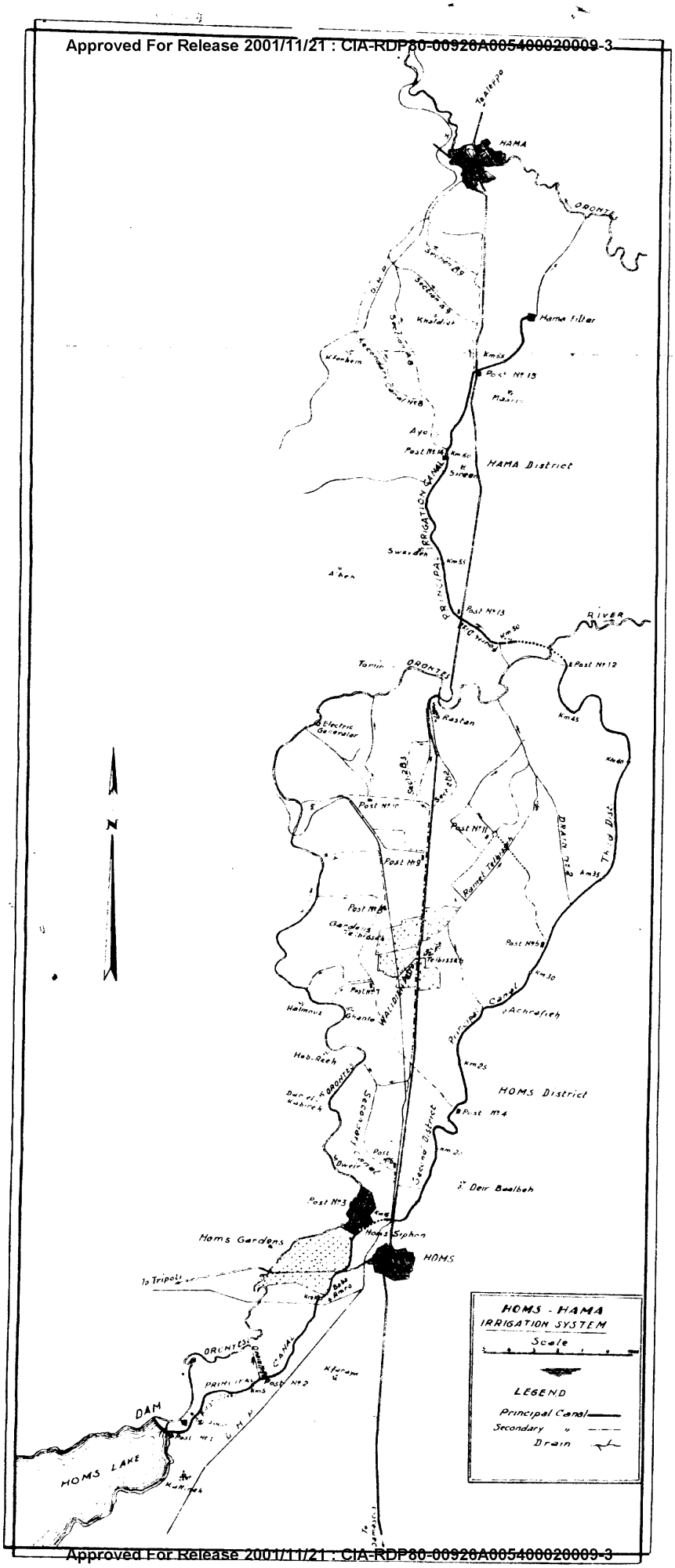
GENERAL SURVEY OF THE HOMS - HAMA IRRIGATION PROJECT.

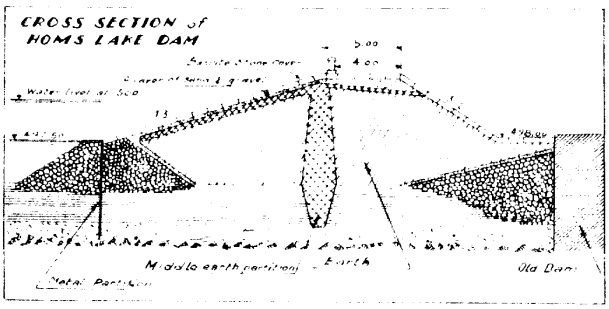
HYDRAULIC SERVICE FOR THE SOUTHERN REGION.

I. Administrative Staff for the Homs-Hama Irrigation System.

The administrative staff for the Irrigation Water Distribution System in the Homs-Hama region is composed of the following officials:

Two constructional engineers
Two maintenance and exploitation engineers
Two Chief Water Distribution Inspectors
Twenty Inspectors and Assistants
Thirty six Watermen and assistants.





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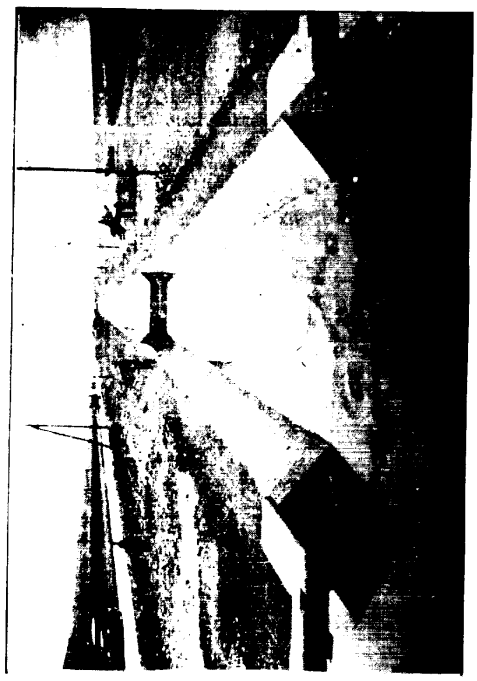

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